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SCIENCE NEWS-LETTER

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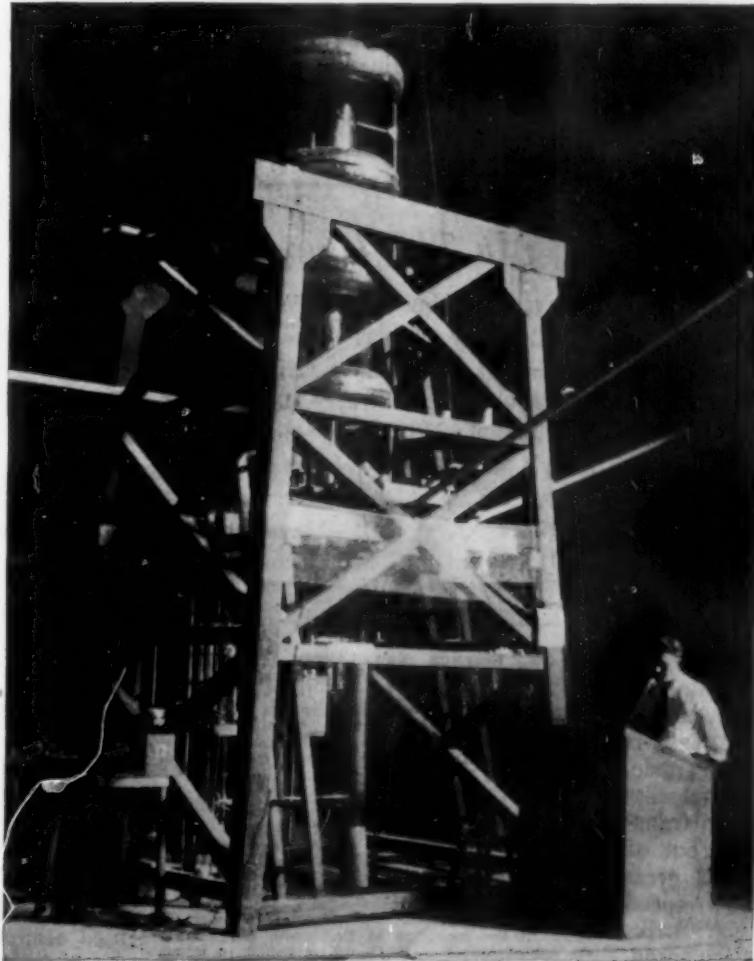
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Nov. 17, 1928



MILLION VOLT X-RAYS

Artificial Cosmic Rays Brought Nearer

(See page 300)

Vol. XIV

No. 397



Measure Atom Layers for Better "Talkies"

Physics

Layers of metallic rubidium, only one atom deep, so thin that several million would be required to equal the thickness of the paper this is printed on, have been measured at the Bell Telephone Laboratories. Thin films of rubidium, a metal similar to the sodium of common salt, are important because of their use in photoelectric cells.

As the magic lamp of modern physics, the photoelectric cell, transmuter of light variations into sound, is the very heart of the revolutions in industry that have been plotted in the physics laboratories. Talking motion pictures, radiovision, television, telephoned photographs would all be impossible without the photoelectric cell.

In the course of researches on how to make the photoelectric cell most efficient, A. L. Johnsrud measured the thin films. When the film of

metal inside the glass cell was very thin it operated better than when thicker. Rubidium can be made into thin films more easily than its relative metals, because at rather low temperatures and without loss of time it can be made to evaporate and the vapor deposited, in a vacuum, to form such a film.

A large photoelectric cell was made and so arranged that rubidium could gradually be deposited on the glass, or else, after a thick deposit had been made, it could gradually be removed. While the film was thus getting thicker or thinner, the photoelectric response, the current given off when light fell on it, could be measured. Since the maximum response was obtained at the same point, whether the film was growing thicker or thinner, it was necessary exactly to record the film's depth.

Ordinary measuring methods proved inadequate and polarized light was used. Polarized light differs from ordinary light because, by passage through a special kind of prism, it is made to vibrate in a single direction. Ordinary light waves vibrate up and down, right and left, and in every conceivable direction, but that of polarized light is confined to a single plane.

When polarized light passes through any film, such as the one of rubidium, the direction in which it vibrates is twisted. The thicker the film, the more it is twisted. By means of another prism similar to that which polarizes the light the extent of the twisting, and also the thickness of the film, is measured. The most current was obtained when the film was but one atom thick.

Science News-Letter, November 17, 1928

Million Volt X-rays

Physics

X-rays, driven by a potential of a million volts, one of the latest of recent achievements of science, are produced by the rather complicated apparatus depicted this week on the cover. In the SCIENCE NEWS-LETTER for June 2, on page 349, this work was described.

The famous Norman Bridge Laboratory of the California Institute of Technology is the scene of these labors. Dr. C. C. Lauritsen, shown at the switchboard, has performed this work, in collaboration with his colleague, Dr. R. D. Bennett.

The tube consists of the glass cylinders in the center. A vacuum of about a billionth of an atmosphere is obtained inside. A water-cooled anode, raised to a potential of a million volts by the laboratory's high-tension transformers, pulls electrons bodily out of the nearby cathode. With this great force, the electrons attain a speed nearly as great as that of light. Striking the anode at this terrific speed, X-rays are formed, which closely resemble the gamma rays of radium. The rays make themselves evident more than a hundred feet away, on the other side of the steel laboratory door when the "tube" is operated.

As the cosmic rays studied by Dr. R. A. Millikan, the director of the laboratory, are really ultra-short X-rays, this forecasts their artificial production.

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Each article is automatically *dated* by its last line.

All of the resources of Science Service, with its staff of scientific writers and correspondents in centers of research throughout the world, are utilized in the editing of this magazine.

Your House May Be a Moron!

Home Economics



AN ELECTRIC PLUG waist-high that requires no gymnastics or stooping. Pulling the connection straight out is also found to be less of a strain on the wires, and lessens the chance of short-circuiting

By DONALD A. LAIRD

Many persons squirm in the presence of a psychologist because they feel that their thoughts are being read, and that they are probably being diagnosed as morons—or worse.

Not content with making every one generally uncomfortable, psychologists are now rating the houses we live in. Some houses which are tremendously expensive are morons. Some small cottages rate as geniuses on the psychological scale for measuring houses.

Everyone will be more comfortable when builders and architects plan houses in accordance with psychological principles. So perhaps psychologists may be forgiven for making people mentally uncomfortable by starting to show up the weak points of their homes.

To reduce fatigue to the lowest possible minimum is one aspect of psychological engineering in the home. This depends partly upon how the floor plans are arranged, partly upon how the furniture and working equipment is distributed throughout the house, and partly upon the planned thoughtfulness with which the housewife does her work.

Obviously a big house is more tiring on the housewife than a small house. A small kitchen with shelf-cupboards on the walls and a space

for the ice box is less fatiguing than a large kitchen with a pantry on one side and an enclosed porch on the other in which the refrigerator is kept. High shelves which require stretching, and low shelves which demand stooping add to the burden of fatigue.

Filigree trimmings on the wood-work and French doors help reduce a house to moron rank by adding to cleaning difficulties.

The telephone should be placed only after thoughtful consideration. The housewife can walk many unnecessary miles every year unless the phone has been placed equidistant from the places where she is usually at work. Ordinarily a convenience, the telephone can readily become a nuisance by thoughtless placing.

Even with a perfectly laid out house, from the psychologist's viewpoint, working habits of the housewife may still generate almost inconceivable amounts of fatigue. Some housewives are famous, almost notorious, as fussy busybodies who are always hard at work and yet accomplish very little. Duplicate dust cloths placed on the second floor will relieve the busybee type of housekeeper of some unnecessary trips up and down stairs.

Stew pans and kettles into which water is drawn in preparing a meal should be placed within easy reach of the water tap. With this arrangement, many steps each day will be saved, since the cook can grasp and fill the utensils with water without having to take a step. Vegetables such as potatoes should also be kept within easy reach of the sink so that they can be picked up, pared and washed without having to take a step or have to stoop.

The coffee canister and the empty pot also belong within easy reach of the sink without taking a step, to keep the kitchen from becoming a moron.

There are many insidious sources of fatigue in the house. Take the way beds are placed in the bedrooms, for instance. They should be set so that the sun or early daylight does not strike the sleeper's eyes; otherwise they make the last hour or two of sleep less refreshing, and the day may be started before one has fully recovered from the fatigue of the previous day.



WHEN DOOR meets door

Noises are also an insidious source of fatigue. This is especially true of noises which will disturb one's sleep without awakening him. A bedroom facing away from the street is often times the best sleeping room since many disturbing and fatiguing street noises are thus avoided.

To avoid all possible embarrassment is another phase of psychological engineering applied to a home.

Before the days of short skirts, hot air registers used to cause considerable embarrassment to women who stepped within range of the breeze. A house with large archways between rooms may give an air of grandeur, but it does not allow adequate privacy to avoid all possible embarrassment. Noisy bath fixtures and poor wall construction which does not prevent the transmission of noise is a cause of embarrassment day in and day out.

The stairway to the second floor should be placed so that when the minister comes to call, the man of the house can go upstairs from the basement workshop to clean up without being seen from the living room.

We have already mentioned the telephone; it may also cause embarrassment if the conversation is overheard by (*Turn to next page*)

Is Your House a Moron—Continued

guests, or even other members of the family. It should be placed in a closet or nook so that conversation cannot be overheard. Even this is not adequate protection on party lines, when all the neighbors lift their receivers and listen in on the conversations every time the phone rings.

Bed room lights should be near the windows, so no revealing shadows can be projected on to the window shades when one is retiring.

A small hamper for soiled clothes should be in each bed room to lessen the temptation to hang discarded clothes up on the floor. This prevents embarrassment from soiled clothes scattered about the room in case company comes. There should be a decorative waste basket in all other rooms of the house to catch scraps and waste the minute they are formed and give the house a perpetual ship-shape appearance. The mad scramble to tidy up when the door bell buzzes is a sign of the moron house.

To avoid all possible annoyance is another phase of making the house psychologically right.

Poorly built houses with windows and doors that stick are the source of much mental irritation and annoyance. So are loose windows that rattle in the least gale. And water taps that drip, drip, drip all day and night.

Small water pipes that lessen the flow of hot water in the bath mixture when hot water is drawn in the kitchen sink come under the annoyance classification—although perhaps they might come under the class of accident hazards, as it has happened that small children have been seriously scalded by the temperature of their bath water changing when cold water was drawn to sprinkle the lawn.

To have to spend ten minutes hunting for a favorite paper or deck of cards is annoying and could readily be avoided if a definite place were allotted for these commonly used items. All members of the family should be thoroughly trained in replacing these in their exact niche.

Electric light switches are especially potent at causing annoyance. This is principally because they are usually hard to find at night. The worst offender is the pull chain switch fastened right at the fixture with a small button dangling in the middle of the room. Try to find it at night and still keep your temper!

There are numerous small items which are used daily which could be purchased in duplicate, or even quadruplicate, to save much irritation. There are ash trays, for instance. The bother of having to hunt all over the house for one, or the worse annoyance of letting ashes fall from a brimming tray to the floor, can be saved if they are generously sprinkled throughout the house. Pencils, too, should be given the same liberal treatment.

"Every home free from accident hazards" is the slogan of the fourth phase of psychology applied to homes.

Mark Twain suggested that going to bed was a very dangerous thing to do, since most people died there. There is no humor, however, in the fact that home accidents lead automobile and factory accidents.

This phase of accidents is subtly connected with the other three of fatigue, embarrassment and annoyance, but is important enough in its own right to be given independent emphasis. If fatigue has not been brought to the vanishing point, the accident hazard is increased because the tired housewife cannot be careful. Under adequate annoyance, also, the irritable husband may lose his temper and suffer an accident caused by blind fury.

Falls are prominent among serious home accidents. Did you ever slip on a rug? Not a large rug, or, a heavy rug, for their weight and size gives enough friction traction to keep them from slipping on even the most hazardous floor. It is the small rugs that connect one room with another that are the principal offenders.

High shelving in closets and cupboards is to be avoided on two scores. It induces the strain fatigue due to stretching, and it precipitates many falls. Small rugs which lie loosely at the tops of stairways are to be severely condemned.

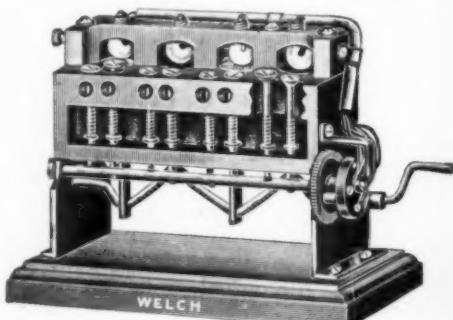
Talk with any man six feet tall about the basement of his house. Prepare yourself for strong language before you ask him, however, for it is probable in nine cases out of ten that he has battered his head against a water or heat pipe in the cellar on the average of once a week for years. The extravagance of digging a deeper excavation can be spared and yet not have a low bridge effect in the basement by a careful routing of the obstructing pipes along side walls

where they cannot batter out gray matter.

Cellar steps usually appear to be an after thought, or perhaps they are devised by the devil himself. Narrow, winding, and dark, they are the dimly illuminated scene of much domestic disaster. To complicate matters further many housewives, driven to desperation over the lack of adequate closet space, drive oversize spikes into the walls of the basement stairway to catch on apron pockets, not to mention ears and eyes.

Frosty weather brings a treacherous slipperiness to the porch steps. There are special slip-proof treads which insure against the hazard of a rude reception to some visitor who may bump himself uncomfortably on several of the steps in one spectacular fall.

This new application of psychology demands a broadened conception of house building. The structural engineer comes into the picture in the specifications of materials to give most satisfactory wear under years of weather strain. (*Turn to page 305*)



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How Michelson Supports Einstein

Physics

When Prof. A. A. Michelson, of the University of Chicago, announced at the recent meeting of the American Optical Society the latest results of his work on ether drift, he returned to one of his first and most famous researches. He also wrote the latest chapter in a history which he began, and in which the theory of relativity, that made famous the name of Einstein, plays an important part.

It was in 1887 that Prof. Michelson, then at the Case School of Applied Science in Cleveland, collaborated with his colleague, Prof. E. W. Morley, in performing the now classical Michelson-Morley experiment. Up to that time scientists were generally agreed in supposing that light waves travelled through a queer medium which pervaded all space, and which was called the ether. If the ether was in all space, then it should be possible to detect the earth's motion through it. The earth travels around in its orbit at a speed of about 20 miles per second. If a beam of light is divided into two parts, then sent in directions at right angles to each other, reflected from two mirrors back and recombined, light and dark bands may appear. These are due to the light waves getting tangled up, and interfering, and so are called interference bands.

If one beam of light has to travel a little farther than the other, the bands are moved and so the method affords a very delicate means of measuring minute displacements. In one form this interferometer has proved a valuable scientific measuring instrument over the center of the instrument.

Motion through an ether would produce the same effect as a lengthening of one of the beams, and so would theoretically cause a shift in the fringes, depending on the direction of the light paths with respect to the earth's motion. Prof. Michelson and Prof. Morley tried the experiment, but found an effect far less than that expected. So small was it that they attributed it to unavoidable errors.

Then physicists began to search around for some explanation of why this effect did not occur. The Dutchman, Prof. H. A. Lorentz, proposed what is now termed the Lorentz-Fitzgerald contraction. This was that motion through space produces an

actual shrinkage of physical objects, which would just balance the effect sought for. As all measuring sticks would be similarly affected, it would be impossible to detect this contraction. Finally, as a further development of these ideas, Einstein proposed his preliminary theory of relativity in 1905, followed by his general theory in 1915.

In the ten years after the publication of Einstein's paper, the three "proofs" of the theory that he suggested were all successful. One was the explanation of the strange behavior of the orbit of the planet Mercury. Another was the bending of light waves as they passed near the sun, shown by observations made during solar eclipses. The third was the shift in the lines of the sun's spectrum when compared with spectra of light from terrestrial sources. Accordingly, the relativity theory was placed on just about as firm a foundation as a theory could be.

But a difficulty appeared in 1925. Dr. Dayton C. Miller, professor of physics at the Case School of Applied Science, where Michelson had first performed his experiment, tried it again. Miller obtained small effects, less than had originally been expected, but apparently definite and consistent. They seemed to show a motion of the earth towards part of the sky near the constellation of Lyra. As astronomers actually recognize the existence of such a motion, the results seemed rather convincing.

Though efforts were made at the time to get Prof. Michelson to comment on this result, surprising to science because it did show an effect, he said nothing. However, he was not satisfied with the situation so he set out to repeat the experiment himself.

No one questioned the accuracy of the original Michelson-Morley experiment. Prof. Miller pointed out that Michelson had obtained a slight effect, attributed to experimental errors, and that it was genuine. Still Prof. Michelson said nothing, but continued his preparations to repeat the experiment on a far more accurate scale than ever before. If he still obtained the small effect, it would be obvious that it was real, but if it were eliminated or greatly reduced, then it would be apparent that in originally attributing it to (*Turn to next page*)

Appalachian Quakes

Seismology

The earthquakes of eastern Tennessee and western North and South Carolina which occurred recently belong to a family of quakes that are well known to seismologists. Though some of these quakes have been severe and felt over wide areas, on the whole they are not especially dangerous, said Commander N. H. Heck, of the Division of Terrestrial Magnetism and Seismology of the U. S. Coast and Geodetic Survey.

"In this respect they differ from the California quakes," he said. "On the Pacific coast the quakes are centered near the surface of the ground, where the damage may be severe, though the shock is not always felt over a very wide area. In the case of the quakes of Tennessee and North and South Carolina, they seem to be very deep. They may be very severe at their centers, and so are felt over a large area, but they are so far from the earth's surface that the damage is ordinarily rather slight."

"These quakes are associated with the Appalachian Mountains, and seem to show that these mountains, from Virginia to Alabama, are still in the process of adjustment. They are quite different in character from the quakes that sometimes occur along the Atlantic Coast, like the famous Charleston quake of 1886. This was a real major earthquake. A different type of earthquake also occurs sometimes in western Tennessee, characteristic of the Mississippi Valley. In the middle of Tennessee, earthquakes are uncommon."

One of the first quakes recorded in this series was in 1874. It was centered in MacDowell County, North Carolina, near Stone Mountain, but was quite local in character. On January 1, 1913, there was one centered in Union County, South Carolina, which was felt over an area of 40,000 square miles. Later in the same year, on March 28, and on April 17, Knoxville experienced shocks, but neither of these was severe.

The most important of the series was on February 21, 1916, and was centered near Skylane, North Carolina. This was felt over an area of 200,000 square miles. Like the others, there was no very severe damage. At Sevierville, Tenn., for instance, some bricks were knocked from chimneys. This seems to have been typical of the damage.

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Casus Belli

Anthropology—Psychology

E. HANBURY HANKIN, in *The Cave Man's Legacy* (Dutton):

A similar state of affairs existed, till modern times, among the New Zealanders. Darwin relates the following anecdote about them:

"A missionary found a chief and his tribe in preparation for war, their muskets clean and bright, and their ammunition ready. He reasoned long on the inutility of the war, and the little provocation which had been given for it. The chief was much shaken in his resolution and seemed in doubt, but at length it occurred to him that a barrel of his gunpowder was in a bad state, and that it would not keep much longer. This was brought forward as an unanswerable argument for the necessity of immediately declaring war; the idea of allowing so much good gunpowder to spoil was not to be thought of, and this settled the point."

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Although Australia is larger than the United States, it has only about one-twentieth of the United States' population.

A loosely knitted or woven garment is warmer than a tightly woven one, a clothing specialist at Cornell states.

Michelson—Continued

experimental errors he had been justified.

The apparatus was set up in one of the buildings of the Mt. Wilson Observatory in Pasadena, Calif. The great steel plate on which the 100 inch mirror of the observatory's great reflecting telescope had been ground was used to support the apparatus. In his experiment originally, and as repeated by Miller, the observer had to walk around it as it turned, at the same time making the observations. The new apparatus was so arranged that the observer made his observations from the room above through an eyepiece directly over the center of the instrument.

Though forced to spend several sojourns in hospitals, Prof. Michelson was assisted by two members of the observatory staff, Francis G. Pease, and Fred Pearson, and the work was carried out. Last September he went to Pasadena to make the final series of observations.

Now he has announced his results. With the motion of the earth of approximately 20 miles per second, the theoretical displacement due to drift through the ether should be about equal to one-half the width of the bands.

"I found no shift as large as a thousandth of the width of a band," Prof. Michelson said.

As the very slight observed shift is about a tenth of what he got in 1887, it now seems certain that it is due to experimental errors, and that the larger effect obtained by Prof. Miller was due to some other cause. Just what this cause was, he does not suggest, and neither does Prof. Miller.

As a result of his studies, Prof. Michelson has now joined the ranks of the relativists.

"I am willing to accept all the consequences of the Einstein theory of relativity," he said.

"In a certain sense, I am responsible for this Frankenstein monster of metaphysical speculation," he continued, referring to the theory. "I confess that if I had foreseen what would have arisen, I should have hesitated in performing the experiment."

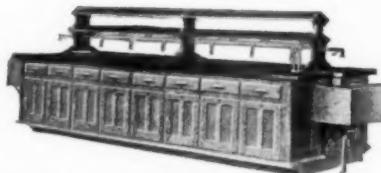
Though he now accepts the relativity theory, Prof. Michelson still maintains his belief in the existence of the ether, though he admits that it cannot be proven.

Science News-Letter, November 17, 1928

For the Teaching of Chemistry

For the teaching of Chemistry, as well as for instruction in other sciences, it is generally admitted that there is no equipment that enjoys the prestige and reputation among educators to the extent of

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Chemical Desk No. 862

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Your House—Continued

His job is largely to guide economical spending in the purchase of materials, oftentimes by recommending a slightly more expensive material which will stand up under years of service better and be less expensive in the long run.

The psychological engineer has the difficult task of correlating all the elements of the building so that they revolve around the dominant features—the human beings who will live in the house. The materials engineer's field is to relate the properties of the various materials to certain building stresses and strains. The psychological engineer's field is to relate materials and forms to human stresses and strains, as we have briefly illustrated.

A house becomes a home, it has been said, when it is designed to live in. This should be amended to specify effective living. And one cannot live effectively even in a palace if it is arranged and used to cause any avoidable fatigue, embarrassment, annoyance, or accident.

Designing and constructing a house to be a genius on a psychological test, however, does not assure in any sense that after people have moved into the house it will still retain its originally high rating. Thoughtless use and poor arrangement of kitchen tables and other details of equipment lower the IQ of many a house that started out with prospects of a brilliant career of efficient service.

Science News-Letter, November 17, 1928

Syphilis Increasing Medicine

The American people are gradually becoming more and more "syphilitized," reports Dr. Charles W. Burr, professor of mental diseases at the University of Pennsylvania, basing his opinion on his many years' experience with patients suffering from the end conditions of this disease.

Change in the type of immigration during the last few generations and the letting down of social standards, particularly those which placed a bar between adolescent boys and girls, are the causes to which Dr. Burr attributes the increase.

Immigrants from Eastern Europe, where the disease is more prevalent, have brought it into this country in large numbers. Modern promiscuity, which has developed since the war, is playing a large part in the work of "syphilizing" the country.

Science News-Letter, November 17, 1928

Fifty Questions to Ask Your House

(Each question answered "Yes" is favorable, a "No" is unfavorable. Rate your house by this questionnaire.)

1. Does the main entrance lead into a vestibule?
2. Is the stairway to the second floor accessible without passing through rooms on the first floor?
3. Are dining-room and living-room so situated that callers in the living-room cannot watch the progress of a meal?
4. Can one enter the bathroom without passing through other rooms or being seen by persons in other rooms?
5. Is the bathroom constructed to prevent the transmission of noises?
6. Are there opaque shades on all windows which prevent silhouettes of persons inside being seen when the room is lighted?
7. Can all doors be opened irrespective of the position of any other door?
8. Are all doors so arranged that when opened they do not cut down light from the windows?
9. Is the water heating system such that hot water can be obtained almost immediately when a faucet is opened?
10. Are all bells non-startling?
11. Are the house numerals in a place where they can be readily seen both day and night?
12. Is there a roomy clothes closet at the front entrance for storing coats and rubbers?
13. Is each bedroom provided with a roomy clothes closet?
14. Are electric switches placed so that it is not necessary to walk into a dark room in search of them?
15. Is the telephone so placed that one's conversation is private?
16. Are the kitchen shelves so arranged that the contents of the highest and the lowest shelf can be reached without stretching or low bending?
17. Can mail be left inside the house by use of a slot or small opening?
18. Can refuse and garbage be disposed of without the use of an unsanitary outside receptacle (by means of incinerator, etc.)?
19. Is the house planned and constructed so that noise transmission from one room to other points of the house is practically eliminated?
20. Are all rooms free from low, slanting ceilings?
21. Can all door locks be opened by a single master key?
22. Are there lights with conveniently located switches in all closets?
23. Is the house situated in a quiet place?
24. Is there toe room under all cupboards in the kitchen?
25. Is the house of fireproof construction?
26. Are the floors slip-proof?
27. Is there a safety handrail beside the bathtub?
28. Do all the rugs lie flat and stationary on the floor?
29. Are all steps seven and a half inches high and nine inches deep?
30. Are all staircases straight?
31. Are all staircases provided with hand rails at a convenient height?
32. Are the cellar ceiling and pipes high enough to make stooping unnecessary?
33. Are the door knobs set in far enough to prevent bruising knuckles on the door frame when closing?
34. Are radiators shielded so as to prevent burning one's self?
35. Is there freedom from the danger of ice and snow falling from the roof in the path of persons below?
36. Is there a safe and convenient means for disposing of safety razor blades, toothpaste tubes, etc.?
37. Is there a fire screen covering the entire front of the fireplace?
38. Are all walks even and level?
39. Does the kitchen adjoin the dining-room?
40. Are the kitchen furnishings so arranged in relation to each other (i. e., distance from stove to sink, etc.) that needless steps and waste motions are eliminated?
41. Is the telephone centrally located?
42. Is fuel stored conveniently near the heating plants (i. e., fireplace, furnace, etc.)?
43. Is the dish cupboard accessible from both dining-room and kitchen?
44. Is there a lavatory and toilet on the first floor?
45. Is there a bedroom on the first floor?
46. Is there a clothes chute from the second floor?
47. Can kitchen utensils be placed or stored where they are used, so that they can be grasped without unnecessary motions and effort?
48. Are the work tables, benches and sink in the kitchen at such a height that when standing erect with arms hanging loosely in front of him and with palms up, one's knuckles just touch the work surface?
49. Is there a stool which can be used while working in the kitchen?
50. Are outlets for electrical appliances which are used intermittently (such as electric iron, vacuum cleaner, etc.) waist high so that stooping is unnecessary in connecting up the appliances?

(And these are only a handful of the questions that the psychologists might ask the average American home in their attempt to determine the fitness of these dwellings for comfortable living.)

Science News-Letter, November 17, 1928

Irishmen in Scotland

Anthropology

Within recent historic times, the north of Ireland was colonized from Scotland. In prehistoric times an exact reversal of this migration took place, and the north of Scotland was peopled from Ireland. So thinks Sir George MacDonald, noted Scottish archaeologist. The story has been pieced out largely from the burial mounds of this part of ancient Caledonia, which are like the burial mounds in Ireland and on the intervening small islands. As the Irish population increased, waves of emigration would surge out over the sea in little boats, finally breaking into the then unpopulated Scottish North.

Science News-Letter, November 17, 1928

World's Debt to Science

General Science—Psychology

J. McKEEN CATTELL, quoted by Albert E. Wiggin in *Exploring Your Mind* (Brentano's):

We shall have in due time a scientific psychology of human welfare, a psychology of the things that are beautiful, good and true, but it will not come by talking about the laws of the mind, but by carefully and laboriously measuring mental operations and processes: we can apply these known measurable and predictable laws of mind to human welfare; for in the end science has no meaning or value other than in its usefulness.

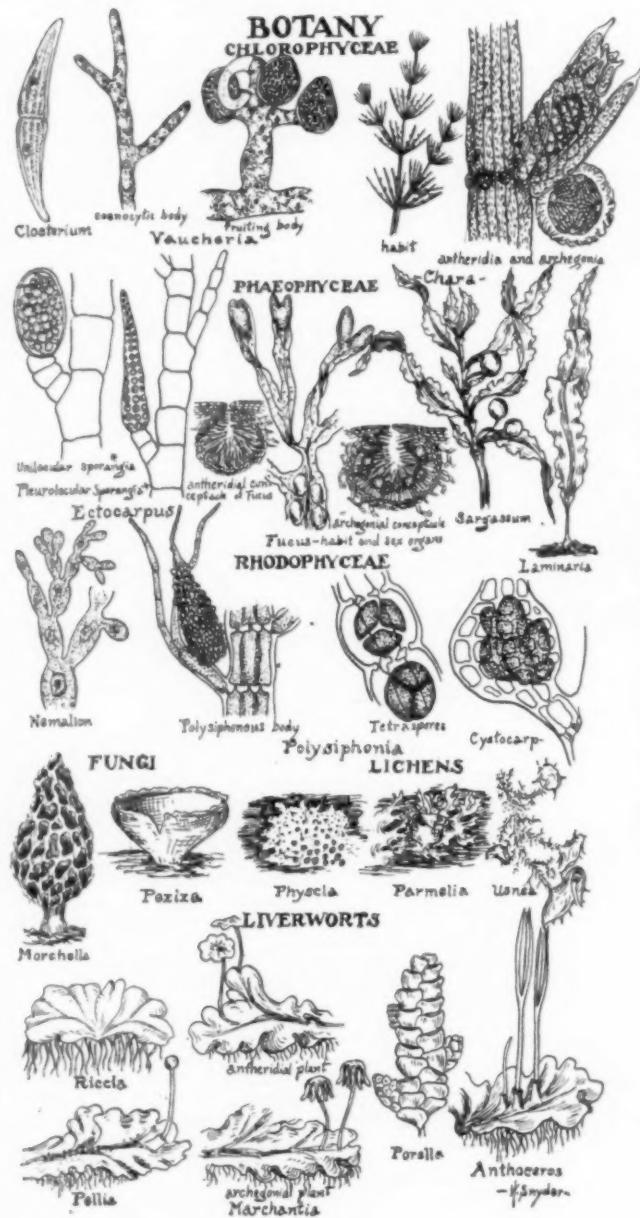
And is it not inspiring to reflect how useful science has been—the most useful thing in all the world? Within even the past one hundred and fifty years science has increased fourfold the productivity of labor; it has doubled the length of human life. Science has made it possible for each to work at a routine task half as long as formerly and at the same time to consume twice as much wealth as formerly. Fourteen hours of labor in which women and children were forced to share formerly provided only hovels, lice and black bread for most people and luxuries for a very few. But now, owing entirely to science, seven hours of labor will supply comfortable homes, warm clothes and healthful food for all. If the resources provided by science were properly distributed, that is, if we had an adequate applied social and economic psychology, there is now sufficient wealth to enable all to share in the desirable luxuries that science has created, and to enjoy to the full measure of each one's natural capacity the most nearly ultimate goods of life, namely, home, friends, things to do, freedom, self-respect.

Science has abolished slavery, the terrible thing upon which past civilizations were mainly built; over a great part of the world it has abolished pestilence and famine. Of the three evil fates, war, pestilence and famine, only war survives from a prescientific and barbarous past. It is still true that much in the modern world is crude and ugly; instincts are atrophied, impulses aborted, and these must be replaced by the products of a science of psychology before living can become free and fine. Those who speak of science as materialistic have narrow thoughts and are themselves lacking in the idealism they so loudly proclaim.

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Radiovision on Air Across Country

Radiovision

The amateur radiovision enthusiast will soon have at least 21 stations broadcasting such programs, located all the way from Lexington, Mass., to Los Angeles, Calif. These are operated by eleven different broadcasters. Nine are now broadcasting, while two have their stations under construction. Several others have applied to the Federal Radio Commission for authority to enter this field, but so far have neither been granted a license to operate nor a construction permit.

Included in this number are three of the chief manufacturing firms. The Radio Corporation of America, in New York City, has three bands of 100 kilocycles width each. One is now in use, while the other two soon will be. The General Electric Company, at Schenectady, N. Y., is regularly broadcasting on three different frequencies, including 790 kilocycles, that of the WGY broadcast station. These are all on ten kilocycle widths. The Westinghouse Electric and Manufacturing Co., of Pittsburgh, Pa., has been assigned two bands of 100 kilocycles width, at wavelengths of 63 and 150 meters. The former is now in use, but on an irregular experimental schedule.

Though the Federal Radio Commission has recently issued a new order regulating radiovision broadcasting, this does not affect the present situation very greatly. One of the chief points is that it may be

Aztec New Years

Archaeology

School children of Peru are being urged to revive one of the most picturesque and important customs of the ancient inhabitants of tropical America—the celebration of the old native new year's day. Last year, young Mexicans revived the festival, which is in accordance with the archaeological findings of Mrs. Zelia Nuttall, well known specialist in Mexican archaeology.

Priests of the Aztecs, Peruvians, and other inhabitants of the tropics watched the skies for a sign to tell them when to record the passing of a year and when to plant their crops. Twice a year, the sun passed through the zenith, and stood directly overhead and they observed that there was a remarkable moment when a vertical object was entirely shadowless, Mrs. Nuttall states. They interpreted this as (*Turn to next page*)

done freely, though with the necessary approval by the commission, on frequencies above 1,500 kilocycles, or wavelengths below 200 meters, the lower limit of the broadcast band. Radiovision broadcasting on frequencies between 550 and 1,500 kilocycles, the present band of the broadcast stations, will be permitted, with certain limitations. One is that no band wider than 10 kilocycles may be used for the purpose. Another is that it shall not be done more than one hour each day, and that it shall not be done between 6:00 and 11:00 p. m., in order not to interfere with broadcast listeners.

All of the present radiovision broadcasters are now using the shorter wavelengths, except the broadcasting stations WGY, WRNY, WCFL and WIBO. None have bands wider than 10 kilocycles, as that is the width of all sound broadcasting bands. Of these stations, only WRNY has been broadcasting radiovision in the evening hours, so that appears to be the only station even slightly affected. However, the radio commission has announced that there will be further reallocations of the radiovision bands. It is believed that this action will be to limit all of these broadcasters to a very few bands, of 100 kilocycles each, and let them divide time on them. In view of the limited power of most of the stations, and the fact that none broadcast more than a

Typhus Expert Honored

Pathology

Prof. Charles Nicolle, to whom the Nobel Prize in medicine for 1928 has just been awarded in recognition of his work on typhus fever, made his first discoveries about the disease in 1909. At that time he was a surgeon in the French Army, stationed at Algiers. Now he is director of the Pasteur Institute of Tunis.

Nicolle found that the body louse was more than a pest and was an actual danger to life and health because it carried the germ of typhus fever. This disease had been a scourge of armies, jails, almshouses, tenements and all places where people live in close contact and without proper means for keeping clean. The louse also abounds in such places. Now, thanks to Prof. Nicolle, it is known that getting rid of the louse prevents typhus fever. (*Turn to next page*)

short time daily, the necessary time division should be worked out to the satisfaction of all.

The Radio Manufacturers Association recently adopted as standard the 48 line, 15 picture per second method, with the scanning across the frame from left to right and top to bottom, as one reads the pages of a book in English. Though some of the broadcasters have not yet adopted this, four are now using it and probably more will follow. Some of the stations are using fewer lines, or fewer pictures per second. This is done in an effort to get more varieties of light and shade in the limited bands now assigned. With the 100 kilocycle band that will be used in the future, ten times the width used by many present broadcasters, it will be possible to send considerable detail with the 48 lines, and fifteen pictures a second.

Even the highest pitched sounds ordinarily heard are below 5,000 vibrations a second, and so may be sent satisfactorily in the present broadcast band. With radiovision, however, the number of vibrations required per second may be many times as great. Hence it requires a wider band. If the number of vibrations is cut by limiting the number of lines to the picture, there is loss of detail, or if the number of pictures per second is lower, there is an objectionable flicker.

Science News-Letter, November 17, 1928

Seven-Inch Tail on Baby

Anatomy

A human tail of almost record-breaking length has just been discovered appended to a baby girl born at Knoxville, Tennessee, one of the states that outlaw evolution. This tail was reported to be seven inches long. The record is a nine-inch tail on a twelve-year-old boy from French Indo-China.

Only about twenty-five authentic cases of babies born with tails are known to science. However, every human being, including the late William Jennings Bryan, had a tail at an early stage of his life, stated Dr. Adolph H. Schultz, associate professor of physical anthropology at the Johns Hopkins University and research associate of the Carnegie Institution of Washington. Dr. Schultz has asked that the unique appendage be sent him for study.

Before birth, when man is in the embryo stage of (*Turn to next page*)

WHAT TO SEE BY RADIO

Science Service Radiovision Broadcasting Schedule

(Revised to November 8, 1928)

BEACON, N. Y.: 2XBU, H. E. Smith, 100 watts, 4,500-4,600 kilocycles or 66 meters. Standard scanning (see note). Station now nearing completion.

CHICAGO, ILL.: WCFL, Chicago Federation of Labor, 1,500 watts, 615-625 kilocycles or 484 meters. Standard scanning. Irregular broadcasts in morning hours.

9XAA, Chicago Federation of Labor, 500 watts, 4,555-4,565 kilocycles or 66 meters. Standard scanning. 1 to 2 p. m., Central Standard Time, daily except Sunday.

WIBO, WIBO Broadcasters, Inc., 5,000 watts, 1,475-1,485 kilocycles or 203 meters. 45 lines per frame, 15 frames per second. Use special scanning disc with three sets of 15 lines each forming complete picture. 1 to 1:30 a. m., Central Standard Time, except Saturday, Sunday and Monday.

LEXINGTON, MASS.: 1XAY, Donald R. Laffin, 300 watts, 4,800-4,900 kilocycles or 62 meters. Standard scanning. 3 to 4 p. m. Eastern Standard Time, daily and irregularly with WLEX for voice.

LOS ANGELES, CAL.: 6XC, Pacific Engineering Laboratory Co., 500 watts, 4,500-4,600 kilocycles or 66 meters. 36 lines per frame, 18 frames per second. 10:30-11:30 p. m. Pacific Standard Time.

MEMPHIS, TENN.: 4XA, WREC, Inc., 5,000 watts, 2,400-2,500 kilocycles or 122 meters. 24 lines per frame, 15 frames per second. Irregular broadcasts.

NEW YORK, N. Y.: 2XBW, Radio Corporation of America, 5,000 watts, 15,100-15,200 kilocycles or 20 meters. Irregular experimental broadcasts with various scanning methods. The Corporation has also been granted construction permits by the Radio Commission for 2XBV, 4,500-4,600 kilocycles or 66 meters, and for 2XBS, 4,600-4,700 kilocycles or 64 meters.

WRNY, Experimenter Publishing Co., 250 watts, 914-924 kilocycles or 416 meters. 48 lines, $7\frac{1}{2}$ frames per second. First five minutes each hour while on air. New schedule pending to conform with G. O. 50, of the Federal Radio Commission, limiting radiovision broadcast on broadcast bands to non-evening hours.

2XAL, Experimenter Publishing Co., 250 watts, 9,695-9,705 kilocycles or 31 meters. Scanning and schedule same as WRNY above.

PITTSBURGH, PA.: 8XAV, Westinghouse Electric and Manufacturing Co., 2,000 watts, 4,700-4,800 kilocycles or 63 meters and 15,100-15,200 kilocycles or 20 meters. 60 lines per frame, 16 frames per second. Irregular experimental schedule.

SCHENECTADY, N. Y.: WGY, General Electric Co., 50,000 watts, 785-795 kilocycles or 380 meters. 24 lines per frame, 20 frames per second. New schedule pending to conform with Federal Radio Commission, G. O. 50.

2XAF, **2XAD** or **2XO**, General Electric Co., 40,000 or 25,000 watts. Under these experimental licenses, frequencies of from 5,996 to 29,982 kilocycles or 50 to 10 meters may be used. At present radiovision broadcasts on one or more of these stations are on 13,655-13,665 kilocycles or 22 meters and on 9,545-9,555 kilocycles or 31 meters. New schedule pending.

WASHINGTON, D.C.: 3XK, C. Francis Jenkins, 250 watts, 6,415-6,425 kilocycles or 47 meters and 1,600 to 1,610 kilocycles or 187 meters. Standard scanning. 8 to 9 p. m., Eastern Standard Time, Monday, Wednesday and Friday. Radiomovies. Equipment now under construction for radiovision and radiomovie broadcasting on 4,900-5,000 kilocycles or 61 meters at 5,000 watts.

NOTE: Standard scanning refers to the standard as adopted by the Radio Manufacturers Association. This uses 48 lines per frame, 15 frames per second, with scanning consecutive, from left to right and top to bottom, as one reads the pages of a book.

Seven Inch Tail—*Cont'd*

his life, he has a tail one-sixth the length of his body. Generally this tail disappears before birth, though the rudiments of the vertebrae in it may be found in man's spinal column, where they are known as the small bones of the coccyx at the end of the spine.

Man's evolutionary relatives, the higher apes, have even less of a tail than man himself, Dr. Schultz said. In the orang-outan the embryonic tail disappears more completely, leaving only two or three rudimentary tail vertebrae. In man there are four or five of these and sometimes six at the base of the spine.

When the tail persists externally, it never has any bones but is made up of nerves, blood vessels and muscles. In man and apes it is evidence of evolution from a tailed ancestor.

Typhus Expert—*Cont'd*

Prof. Nicolle experimented with monkeys and apes. First he injected blood from a typhus fever patient into chimpanzees. These apes got the disease. From the chimpanzee he transferred the disease, in the same way, to another kind of monkey. Finally he transmitted typhus from monkey to monkey by the bite of the body louse. This proved to be the way in which the disease is carried from man to man.

Nicolle's work has since been substantiated by other workers. This discovery formed the basis of typhus fever prevention in the armies during the World War. De-lousing to check and prevent typhus is now a regular public health procedure like vaccination for the prevention of smallpox.

Aztec New Years—*Cont'd*

the descent of the Sun-God, and knew that it meant the coming of the rains and that crops must be planted.

Mrs. Nuttall, who is now in New York, states that revival of the celebration as a national festival of school children in Peru is advocated by the Geographical Society of Lima.

Science News-Letter, November 17, 1928

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CLASSICS OF SCIENCE:

Clausius on the Blue Sky
Physics

Scientific curiosity investigates the most commonplace as well as the rarest phenomena. The play of color in reflected light, to which Clausius refers, is seen beautifully in ordinary soap bubbles or in thin soap films made by dipping loops of wire into a strong soap solution. Note the order in which the colors appear as the film becomes thinner.

On the Blue Colour of the Sky and the Morning and Evening Red, by R. Clausius. From Poggendorff's *Annalen*, Vol. lxxvi, p. 188. Translated by John Tyndall, 1853.

Reflection by Water Particles

It is remarked, in the course of the foregoing paper, that the blue colour of the sky and the morning and evening red stand in close connexion with the reflexion of light in the atmosphere. Among many conjectures on this subject, the assumption that the reflexion takes place on minute bladders of water is often stated to be that which explains these phænomena most completely. For example, Newton says,—“The blue of the first order, though very faint and little, may possibly be the colour of some substances; and particularly the azure colour of the skies seems to be of this order. For all vapours, when they begin to condense and coalesce into small parcels, become first of that bigness, whereby such an azure must be reflected, before they can constitute clouds of other colours. And so, this being the first colour which vapours begin to reflect, it ought to be the colour of the finest and most transparent skies, in which vapours are not arrived to that grossness requisite to reflect other colours, as we find it is by experience.”

Newton does not enter further into the matter, and it appears to me doubtful whether he had a clear view of the subject. When here, and still more plainly in another place, he says that water particles, when they increase in size, must produce clouds of different colours, in my opinion he is in error, as I shall show further on. It seems also as if by water particles he meant solid spheres instead of hollow vesicles, which supposition, according to the previous discussion, is not admissible.

After Newton, many investigators have given in their adherence to the supposition of vapour vesicles; but I find the theory nowhere mathematically developed, and it is by no means generally accepted. On the contrary, another mode of explanation, that for example of Brandes in Gehler's *Wörterbuch*, according to



BLUE SKY AND WHITE CLOUDS. Note how the color of the sky becomes paler toward the horizon. (Photograph by A. G. Henry)

which the *particles of air* themselves reflect the blue light in a greater proportion than the red, seems to have obtained more general recognition than the other.

After the foregoing considerations, a few words upon this subject will doubtless appear justifiable.

As every vesicle of vapour consists of a filament of water curved spherically, if it be assumed as very thin in comparison with its diameter, it exerts upon a ray of light passing through it twice the influence that would be experienced by a ray in passing through a *plane* layer of water of the same thickness. We may therefore apply in this case the known theory of thin plates.

The Blue Color

Assuming, in the first place, the thickness of the plate as so inconsiderable that it exactly amounts to a quarter of an undulation of the extreme violet, and let the light be supposed to fall perpendicularly . . . the reflexion of these rays is thus the greatest possible. The other rays, on the contrary, will be the less reflected the greater their wave-lengths; and the mixture of all gives a whitish-blue. If the light falls obliquely on the same plate . . . the violet would no longer undergo its maximum reflexion, while the other circumstance would remain unchanged, that all the remaining rays would be still less reflected, the difference increasing as the wave-lengths dimin-

ish. The total light would be therefore weaker, but still blue.

This latter phænomenon must continually take place when the thickness of the plate is still less than that assumed above. The reflected light must appear as a darker and darker blue, until the plate becomes too thin to reflect light at all, a result which is obtained from the simple consideration of the rings of Newton, where blue is the first colour which surrounds the black centre.

Let us, on the contrary, suppose that the thickness of the plate becomes gradually greater than that assumed above, the violet will be more feebly reflected, and instead of it some other colour will undergo its maximum reflexion, and so the tint of the whole light will be changed. As the thickness increases we obtain the series of colours observed in Newton's rings, namely, blue, white, yellowish white, orange, red, violet, blue, &c.

This result must also find its application in the atmosphere, where vesicles of vapour take the place of the thin plates. Those vesicles which float in the air in serene weather must certainly be very thin; and if we assume that their thickness does not exceed the fourth part of an undulation of the violet light, the blue colour of the reflected light of the firmament would follow as a necessary consequence, and the clearer the air, that is, the finer the vesicles, the more deeply blue would it appear. (Turn to next page)

Claudius on the Blue Sky—Continued

When, on the other hand, the air becomes more moist and the vesicles no longer possess the requisite fineness, it might be imagined that the firmament, instead of blue, ought to exhibit the other colours in their proper order. This, however, is not the case. When in moist weather the vesicles increase in thickness, new fine vesicles are in the act of forming at the same time, so that we never have a definite thickness for all, but at most a limit value, which does not exclude the smaller ones. When this limit is a little exceeded, then with a large quantity of blue we have a little white. As the thickness increases we have blue, white, yellowish-white, and again blue, white, yellowish-white, orange, etc. Hence new colours perpetually add themselves to those already present, and the mixture of all can only add to the original blue a more or less perfect white, by which the former obtains a milky appearance, and may slowly pass into white altogether.

With this the actual process in the atmosphere coincides most completely. Even in clear weather the sky towards the horizon generally appears

whitish, for the eye thus directed, besides looking through a thicker mass of air, looks along the surface of the earth, where, at least at certain moist places, probably thicker vesicles are suspended than at greater elevations. As the air becomes moister the white expands and the whole appearance of the firmament becomes duller. In fogs and clouds the thickness of the bladders must be assumed to be much greater, but we must not therefore expect, as Newton did, that the clouds can produce, by reflexion, definite colours of a higher order, for it would be quite unnatural to suppose that the cloud is composed of vesicles all of the same thickness. On the contrary, we must expect here the greatest variety, so that clouds illuminated by white light must appear white, which is indeed the case.

We now pass over to the consideration of the *transmitted* light. As it is complementary to the reflected light, it follows that so far as it is sensible it must appear as orange. With regard to the quantity of the white light mixed along with it, however, an essential difference takes place. . . . so that the tint of the entire light must

be very feeble. When the incidence is oblique the colouring indeed increases, but with great slowness. . . .

Orange Sunset Color

Fixing our attention on a vesicle of vapour, all possible angles of incidence are presented to us, but to the greatest and smallest angles, as is readily seen, comparatively small quantities of light belong, so that the medium angles are those to which the principal part belongs. But these produce but a very feeble tinting, and hence the *entire* light which passes through a vesicle must be but feebly coloured. Hence it is that the sun, when it stands high in heaven and the rays pass through a comparatively short length of atmosphere, appears white, particularly as we have no absolutely white beside it with which to compare it. When, on the contrary, the orb is near the horizon and has to transmit its light through numerous vesicles, the orange colour obtains a decided predominance.

Finally, the circumstance that at sunset not only the sun's disc but also a considerable portion of the horizon, and even clouds which float on high appear coloured orange, is easily explained without assuming that these colours are in the first place due to reflexion. As every object which appears white in white light, in orange light must appear orange, the same takes place on the horizon, which, as remarked above, appears whitish by day.

The explanation of the blue colour of the firmament and the morning and evening red, follow therefore from the assumption of vapour vesicles in the atmosphere, so naturally and simply, that on this account alone the above assumption ought, I think, to be regarded as probable. After having shown however in the foregoing paper that on other grounds the assumption is almost of necessity forced upon us, its easy applicability to the explanation of such grand phenomena furnishes a gratifying corroboration of the result arrived at.

Rudolf Julius Emmanuel Clausius was born in Koslin, Germany, January 2, 1822, and died in Bonn, August 24, 1888. His entire adult life was spent in the Universities of Germany, except for service at the head of a Bonn University ambulance corps during the Franco-German War. He was one of the great mathematical physicists of the nineteenth century. His greatest discovery, the formulation of the second law of thermodynamics, "Heat cannot of itself pass from a colder to a hotter body," was announced when he was 28 years of age.

Science News-Letter, November 17, 1928



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FIRST GLANCES AT NEW BOOKS

HUNGER FIGHTERS—Paul de Kruif—*Harcourt, Brace* (\$3). Some of the more important adventures in plant industry, animal husbandry and vitamin research are told here in the style that made "Microbe Hunters" a competitor with the best sellers in fiction. De Kruif is certainly a great poster artist, with his big, bold, splashing adjectives. Some of the more meticulous critics don't like it; say it's "jazz," and not always accurate; but the main lines are in the right place; and the people certainly read it. The present work differs from "Microbe Hunters" in that it is current, or nearly current, history; most of the men he talks about are still living, some of them are not even middle-aged. So swiftly have events moved, indeed, that his section on vitamin research (Hidden Hunger, he calls it) is already in need of revision and bringing up to date.

History of Science

Science News-Letter, November 17, 1928

NATURE AND SCIENCE EDUCATION REVIEW—Published by Arthur Newton Pack—(Quarterly: \$1 a year). Nature study is finding its way into the curriculum of even the smallest schools, and problems of course content and teaching method are assuming considerable importance. This new venture in the professional magazine field, therefore, meets a real and as yet unsupplied need. It is to be hoped that those whom it is designed to serve will help it to succeed.

Nature Study

Science News-Letter, November 17, 1928

THE NEW RUSSIA—Dorothy Thompson—*Holt* (\$3). Miss Thompson presents a series of hard-finished photograph-like pictures of economics, politics, education as they exist in the U. S. S. R. Her views appear to be impartial, and are not encouraging. As for the ordinary amenities of existence: "The whole world stank of dishcloths."

Sociology—History

Science News-Letter, November 17, 1928

OUTLINE AND GENERAL PRINCIPLES OF THE HISTORY OF LIFE—W. D. Matthew—*University of California Press* (75c). Although published as a syllabus of the lectures in a university course, this small book is very well fitted for the reading of any one who wants to get in brief form the story of life on this planet.

Paleontology

Science News-Letter, November 17, 1928

CHEMISTRY IN MEDICINE—By various authors—*Chemical Foundation* (\$2). Here is a book that has long been needed and has never before been available. A single volume of 780 pages and small enough to be carried about in the pocket without spoiling the set of a coat, containing a résumé of recent researches in therapeutic chemistry by 43 foremost authorities. Here you can get in compact form Abel on the suprarenal glands, McCleod on insulin, Stieglitz on fundamental problems, McCollum on vitamins, Kendall on thyroxine, Collip on parathyroid glands, Goldberger on pellagra, Hess on scurvy, Luckhardt on anesthesia, Stockard on sex glands, Voegtlin on chemotherapy, and the rest equally important. All handy for reference and most of them easily readable by the layman.

Chemistry

Science News-Letter, November 17, 1928

INDUSTRIAL CHEMISTRY—Emil Raymond Riegel—*Chemical Catalog* (\$9). A much needed book and admirably done. There is no field in which it is harder to get reliable and up-to-date information than in industrial chemistry, and this volume gives just what the average man wants, a succinct account of products and processes, prepared with the collaboration of experts, and giving references to special papers and treatises. A useful book for business men as well as libraries and schools. The chief topics treated are acids, alkalies, cement, pottery, fuels, fertilizers, coal products, glass, electrothermal products, cellulose, dyes, perfumes, explosives, rubber and metals.

Chemistry

Science News-Letter, November 17, 1928

FORESTS AND WATER IN THE LIGHT OF SCIENTIFIC INVESTIGATION—Raphael Zon—*Government Printing Office* (20c). With flood control certain to continue in its present prominent place in public discussion, engineers, foresters, public men and all interested citizens will find this pamphlet by one of America's best-known forest scientists very useful.

Forestry

Science News-Letter, November 17, 1928

THE CHEVALIER BAYARD—Samuel Shellabarger—*Century* (\$4). A close look at the last of the armored knights.

History

Science News-Letter, November 17, 1928

A HISTORY OF MATHEMATICAL NOTATIONS; VOL. I—Florian Cajori—*Open Court* (\$4). When we make our daily use of our relatively simple system of numerals, we are apt to forget the more complicated and cumbersome methods used in past ages. In this substantial volume Prof. Cajori gives a complete and scholarly account of the development of the notations of elementary mathematics from the Babylonians on. The second volume, to appear later, will treat of notations in higher mathematics.

Mathematics

Science News-Letter, November 17, 1928

MATHEMATICAL TABLES—*Chemical Rubber Co.* (75c). A reprint of the section on mathematical tables in the publishers' invaluable "Handbook of Chemistry and Physics," giving in a small pocket form five-place tables of logarithms, logarithmic and natural functions, hyperbolic functions, exponentials, etc.

Mathematics

Science News-Letter, November 17, 1928

ALGEBRA FOR SECONDARY SCHOOLS—Stephen Emery and Eva E. Jeffs—*Van Nostrand* (\$1.85). A new elementary algebra, consisting chiefly of problems, interspersed with brief explanations.

Mathematics

Science News-Letter, November 17, 1928

IRISES—F. F. Rockwell—*Macmillan* (\$1). This very worthy addition to the Home Garden Handbooks series discusses the botany, culture and decorative values of what some one has most aptly called "the poor man's orchids".

Botany

Science News-Letter, November 17, 1928

THE PHYSICS OF CRYSTALS—Abram F. Joffé—*McGraw-Hill* (\$3). Here are presented in book form the lectures given by this famous Russian scientist while visiting the University of California. It is a full discussion of crystals from the physical viewpoint.

Crystallography

Science News-Letter, November 17, 1928

SCIENCE FOR YOU—J. G. Crowther—*Brentano's* (\$2.50). A well-written little book, prepared in England, on a number of scientific subjects. Meteorology, astronomy, mining, physics, ultra-sonics, cathode rays and X-rays are among the things treated. A few illustrations, however, would have made many of the subjects even clearer.

General Science

Science News-Letter, November 17, 1928

First Glances At New Books—Continued

AN ALPHABET OF AVIATION—Paul Jones—*Macrae-Smith* (\$2). A glossary of the now common terms used to describe aviation, defined for the layman. The numerous diagrams assist the already clear accounts, but perhaps the chief feature of the book, and certainly the most attractive, is the series of colored, poster-like illustrations by Edward Shenton that adorn the alternate pages.

Aviation

Science News-Letter, November 17, 1928

PRACTICAL FLYING—Byron Q. Jones—*Ronald* (\$3). Major Jones, as an experienced teacher of flying, here puts his experience where all can consult it, and answers such common questions of the prospective amateur aviator as "Can I learn to fly?" "What makes a plane fly?" "Why does an airplane maintain its balance?"

Aviation

Science News-Letter, November 17, 1928

BEGINNING TO FLY—Merrill Hamburg—*Houghton Mifflin* (\$2.50). Tells all about how to make model airplanes, and also gives a brief account of the history of aviation. Any teacher with a flock of air-conscious young tinkerers in his classes needs this book.

Aviation

Science News-Letter, November 17, 1928

SAILING CRAFT—Edwin J. Schoettle—*Macmillan* (\$12). An extremely interesting book, not only to amateur sailors, but to the landlubber as well, as the introduction by A. Edward Newton, who boasts of never having "rowed a boat, much less sailed a yacht" in his life, will testify. The author states that the title has a double meaning—the word "sailing" is both an adjective and a verb. In almost 800 pages are contained full descriptions of all types of pleasure sailing craft, and discussions of their use. A chapter by Edward P. Warner, now assistant secretary of the Navy for aviation, and Shatswell Ober, on "The Aerodynamics of Yacht Sails" furnishes the scientific aspect. But what is incomprehensible is why publishers of the experience of Macmillan should issue a book as copious as this without an index!

Naval Architecture

Science News-Letter, November 17, 1928

PARK RECREATION AREAS IN THE UNITED STATES—Bull. U. S. Bur. Labor Statistics No. 462—*Govt. Printing Office* (25c). A statistical survey of city parks.

Sociology

Science News-Letter, November 17, 1928

REVISION OF ROWLAND'S PRELIMINARY TABLE OF SOLAR SPECTRUM WAVE-LENGTHS—Charles E. St. John and others—*Carnegie Institution* (\$2.75). For the past generation, Prof. Rowland's table has been the world standard, and as such has been most satisfactory. But the development of interferometric methods of wave-length measurements has now permitted a much higher degree of precision than Rowland had at his disposal. This book represents the fruits of labors of Dr. St. John and his associates for more than a decade, and extends the original table to the present limit of the infra-red. It will be welcomed by physicists and astronomers the world over.

Astrophysics

Science News-Letter, November 17, 1928

SAN LUIS CATALOG—Dudley Observatory—*Carnegie Institution* (\$3.25). This book is a good demonstration that all the astronomer's work is not looking through a telescope. The observations on which it was based were made at San Luis, Argentine, between 1909 and 1911, yet the catalog is just out. It includes the positions of 15,333 stars, mostly in the southern hemisphere. It "constitutes one of the steps in a general program formulated by Lewis Boss, with the object of producing the positions and motions of all stars brighter than magnitude 7.0."

Astronomy

Science News-Letter, November 17, 1928

KANT'S INAUGURAL DISSERTATION AND EARLY WRITINGS ON SPACE—John Handyside, Translator—*Open Court* (\$2). A new translation of the inaugural dissertation of the great German philosopher and the first English translation of some of his early writings on space, containing, perhaps, some of the first inklings of what has since developed into the relativity theory.

Philosophy

Science News-Letter, November 17, 1928

THE STORY OF ENGINEERING IN AMERICA—Chelsea Fraser—*Crowell* (\$2.50). All about the achievements of the profession whose most distinguished representative has just been elected to the Presidential chair. The author tells, in a style interesting to young and old, how railroads, bridges, tunnels, lighthouses, mines and other works of the engineer have transformed America from a wilderness into the great nation that it is today.

Engineering

Science News-Letter, November 17, 1928

OUR WONDERFUL UNIVERSE—Clarence Augustus Chant—*Ryerson Press (Toronto)* (\$1.50). This little book, by the professor of astronomy at the University of Toronto, is the latest of the popular books on astronomy, and is also one of the best. Though simply written, in order to be comprehensible even to children, the author does not "talk down" to his readers, and the book will be of interest to adults as well. The illustrations are particularly well selected, including a number that do not ordinarily appear in such a book, but which add to its interest.

Astronomy

Science News-Letter, November 17, 1928

ROMANCE OF THE MOON—Mary Proctor—*Harper* (\$2.50). This is the third in Miss Proctor's interesting series of astronomical romances, the first two having been of the sun and of comets. In style it is very similar to the other two, including both ancient ideas and mythology, and modern scientific research. One of the most interesting parts has to do with the ideas of Prof. Goddard of Clark University on the possibility of sending a rocket to the moon.

Astronomy

Science News-Letter, November 17, 1928

ORIENTAL AND OCCIDENTAL CULTURE—Maurice Parmelee—*Century* (\$4). A general summing up and analysis of the most significant differences between East and West, such as social organization, failure of the Orient to develop science, the part played by religion in the oriental countries, and the effects of western influence on politics and education in the east. The author's travels through China, India, Japan, and smaller countries of the East, and his meetings with noted and well informed people there provide many incidents to emphasize and clarify the points made in the discussion.

Sociology

Science News-Letter, November 17, 1928

WEATHER—E. E. Free and Travis Hoke—*McBride* (\$3). A new book on meteorology, planned, say the authors in their preface, "not logically but psychologically. All the authors' acquaintances . . . were asked what they most felt need of knowing about the weather. . . . So far as possible the queries are answered here."

Meteorology

Science News-Letter, November 17, 1928

Gorilla Carvings Are Maya Mystery

Archaeology

Monstrous gorilla-like figures of stone, coming from the gorilla-less land of the Mayas, are one of the unexplained curiosities of the Archaeological and Historical Museum in Merida, Yucatan.

There are two of these creatures, legless, but standing more than five feet high on their stumps of thighs. They are rude but powerful works of art, done in rough and pitted limestone. They were brought to the museum a short time ago by Don Luis Rosado Vega, founder and director of the institution, who discovered the stone monsters sitting along at the bottom of a hill near the town of Tekax, Yucatan.

The nearest ancient cities to Tekax are Uxmal, Labna and Kabah, but these are many miles away from where the stone figures were found, and there were no other associated archaeological remains which might give a clue to their meaning or origin.

That they are more primitive than

Keep Milk Dark

Dairy Chemistry

Milk exposed to sunlight quickly develops a linseed oil odor and cardboard taste, experiments by the Bureau of Dairy Industry of the Department of Agriculture just completed show.

The light acts as a catalyst, causing oxidation much more quickly than milk kept in the dark. In reaching this conclusion the bureau prepared a series of duplicate samples of milk, one set of which was exposed to daylight and the other kept in the dark. In all cases the samples kept in the dark developed no off flavors or odors, even after seven to nine days at near freezing temperatures, whereas the samples kept in the light at the same temperatures developed the characteristic cardboard odor and taste after 20 to 48 hours, of which 8 to 26 hours were daylight.

The experiments were undertaken because of a general supposition that indirect or diffuse daylight had little effect on the milk. The samples in the tests were never exposed to direct sunlight but were placed in a north diffuse light, proving that milk should not be kept in any sort of sunlight.

Science News-Letter, November 17, 1928

The Antarctic continent is larger than Europe.

carved warriors and feathered snake figures so commonly found in the ancient cities of northern Yucatan, is apparent. There is no effort at conventionalizing, which is characteristic of the carvings at Chichen Itza and other ruined cities, and the lines are realistic. Whether the unknown sculptor chose the pitted limestone, or whether time and the weather have eaten out the softer parts cannot be told.

One of the figures seems bisexual, for while it has the masculine characteristics, it carries a child, mother-like, in its left arm. Both figures stand in striking ape-like posture. They have beetling brows, broad chests and an anthropoid stoop, and they represent creatures of powerful physiques.

No tales of any kind remain to explain their meaning, and villagers of Tekax merely knew that the stone figures had sat for a long time in the lonely place by the hill.

Science News-Letter, November 17, 1928

Horned Toads on Wane

Zoology

Requests for the protection of the horned toad have been received by the Department of Agriculture. The correspondents claim that the business of collecting the reptiles and selling them to tourists and other people has assumed such proportions that they are rapidly being exterminated, and thereby the farmer is losing a valuable ally in killing insects which are destructive to crops.

The Biological Survey of the Department of Agriculture has investigated the habits of the horned toad and has found that they feed chiefly on destructive insects, such as grasshoppers, caterpillars, wire worms, blister beetles, leaf beetles, weevils, chinch bugs and harvester ants. Their chief value lies in killing ants, which are so destructive in tropical countries and troublesome in warm climates of the United States.

The horned toad is not a true toad at all, but a fat-bodied lizard in an armor of spines.

Science News-Letter, November 17, 1928

A machine to test the fastness of dyed fabrics during laundry processes has been invented.

Balsa, one of the world's lightest woods, was named from the Spanish word meaning raft.

NATURE RAMBLINGS

BY FRANK THONE

Natural History



SG

Chinquapin

Chestnut blight, which has swept over the old Appalachian forest like one of the plagues of old Egypt, blotting a whole noble species out of existence, leaves an older generation with only the memory of what real chestnuts tasted like, and a younger generation with only traditions of that memory. A very real American tradition passes with the American chestnut.

But the same pallid destroying angel that has slain the chestnuts passed over a lesser relative of theirs, possibly as one too humble for a first-class pestilence to stoop to. We may well offer thanks that the chinquapin has been spared, though as yet its little nuts have not become articles of commerce in competition with the inferior European chestnuts which are now being offered as sorry consolations for our vanished native tidbits. The chinquapin is still a matter of special luck and energy in finding and gathering, or of special favor from boys who have overflowing pockets. These little chestnuts, much smaller than their vanished cousins, are of even finer flavor in the opinion of most of the cognoscenti among our native nut-nibblers.

The chinquapin is a small tree, or more usually a large shrub, with leaves more or less like those of the chestnut. It takes most kindly to hill country, and it likes dry, rocky slopes. It is found from Pennsylvania south to northern Florida, and across the South into Texas.

There is an oak that is called chinquapin in some parts of the Ohio valley; but that is a rank libel on the true shrub, and this misuse of the name should be sternly discouraged.

Science News-Letter, November 17, 1928

Japanese children are engaging in a dental hygiene campaign.

Physical Concepts in Biology

Philosophy of Science

HENRY OSBORN TAYLOR, in *Human Values and Verities* (Macmillan):

With the crumbling of the old entities and the new rivalry among mathematical postulates, the foundations of physical theory are shaken. As for the biological sciences, their ultimate basis must lie in physics, and be shaken by the changes in physical theory, even as the flora and fauna of the earth's surface are disturbed by subterranean tremors. Yet plants and animals go on their ways heeding little of what is taking place beneath the soil, and biologists worry as little as possible about relativity and nuclei and electrons. They have troubles of their own from the complexity and trickery of living organisms, the unlooked-for behaviour of the phenomena of life.

It may be that biology has its own postulates, superimposed on those of physics. Biologist, as well as physicist, contents himself with seeking the *how* without looking beyond what Claude Bernard called "*la cause prochaine ou les conditions d'existence des phénomènes*." Doubtless today "invariable antecedent" or some other non-committal phrase would be substituted for the word "cause". As a general postulate the biologist might

insist upon that which the same clearseeing Frenchman called the absolute principle of determinism which he asserted no biologist could doubt—"un principe scientifique absolu. Ce principe est le déterminisme des phénomènes qui est absolu aussi bien dans les phénomènes des corps vivants que dans les corps bruts." This word has a rather different philosophical meaning in English, but I think the French savant meant by it that a given antecedent or condition or *cause prochaine* inevitably issues in the same resulting phenomenon. It seems to me a precise and specific statement of the fundamental scientific postulate or belief in an invariable or rational order in nature. It amounts to a claim that biology is or may become a precise science, like physics or chemistry. This is what biologists are working for. Yet a more instructed realization of the perplexing and unexpected conduct of organisms has since Bernard's time driven the worker to contemplate the possibility of more than one interpretation of his experiment. He might hesitate to affirm so unequivocally the unqualified determinism of organic phenomena.

There may be other biological postulates or imperfect inductions that

apply only to living organisms. For example, Harvey's *omne vivum ex ovo* and Virchow's *omnis cellula e cellula* (1855). The first may need qualification, since the growing organism takes much into its substance which could scarcely be said to come *ex ovo*. No exception might be taken to the second but that it dates from a time when the cell was imagined to be a homogeneous body, and of course cytologists are now trying to state specifically how the parts of the succeeding cells come from the corresponding parts in the parent.

There may be still another general biological conviction that every living organism has some quality besides its physical or chemical constituents, even though that quality be but a pattern or configuration. A living thing is not simply the sum of its tangible components. The succeeding and apparently related phenomena of a living organism conduce to the continuation of its existence and functioning. There is no need to endow such phenomena with purpose. With reason most biologists reject the crude term of vitalist. But they might well refuse to be called mechanists just because they work along the ways of physics and chemistry.

Science News-Letter, November 17, 1928

The Egg as a Physical System

Biology

SIR WILLIAM B. HARDY, in *Colloid Symposium Monograph* (Chemical Catalog Co.):

Let us in conclusion consider the ovum as a physical system. Its potentialities are prodigious and one's first impulse is to expect that such vast potentialities would find expression in complexity of structure. What do we find? The substance is clouded with particles but these can be centrifuged away, leaving it optically structureless but still capable of development.

On the surface of the egg there is a fine membrane, below it fluid of high viscosity, next fluid of relatively low viscosity, and within this, the nucleus which is, in the resting stage, merely a bag of fluid enclosed in a delicate membrane. How shall sources and sinks of energy be main-

tained in a fluid composed largely of water? They undoubtedly are there for the egg is a going concern, taking in oxygen and maintaining itself by expenditure of energy.

Clearly the ovum is possible only as a paradox. It is no pangenetic structure—a mosaic of all the parts to which it will give origin. Tristram Shandy's theory is false. To play its part it can only be the simplest form of living matter, but its simplicity is neither that of a machine nor of a crystal but of a nebula. Gathered into it are units relatively simple but capable by their combinations of forming a vast number of dynamical systems into which they fall as the distribution of energy varies. After all, a nebula holds within itself the beginnings of a history more complex even than that of an ovum and yet, so far as struc-

ture is concerned, it is but a simple affair!

The more there is known about living matter the more there is revealed a curious simplicity. Sheeman finds skin transmuted to brain or brain to skin, but the agent which effects the change appears to be a chemical substance probably of quite ordinary character. You may lead living matter as you may a donkey with a carrot—but you have to choose the carrot with some care.

Biology halts on the mechanical side because it needs the services of men who are at once real physicists and real biologists—both faculties being within the same brain. Biochemistry has made its great advances because it has been served of late by men who are both real chemists and real biologists.

Science News-Letter, November 17, 1928